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Economic Value of Recreation Benefits Determined by Three Methods

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Consumer's surplus, monopoly revenue, and visitor survey methods all yielded value-per-visitor-day figures near $1, but total values differed considerably. The monopoly revenue method is freest of uncontrolled bias, but none of the three measures "market price" in the usual sense.

KEY WORDS: Forest recreational use, forestry business economics, recreation economics.

Introduction

Managers are encountering more and more conflicting demands for use of land and water resources. Decisionmaking aimed at an "optimal" pattern of use of natural resources must rely upon some measure of value to society of each possible use. Market prices supply the appropriate measure of value in many instances, but in others, such as the recreational use of public wild lands, such prices are lacking. As a result, the decisionmaking process is frustrated, political pressures and emotion begin to dominate the process, and it is questionable whether recreational resources are allocated in an optimum manner.

To relieve the need for recreation values, economists have devised several methods for imputing value to recreation benefits. Usually, when a "value" for recreation benefits is wanted, one of the several methods is selected and its particular result used. Because the methods differ considerably, three of these, the consumer's surplus, monopoly

revenue, and visitor survey methods, were compared in the present study. While the theory and methodology of these are omitted here, the results of an evaluation of one recreation area with each of the three methods are given, along with a few precautions for their interpretation. To indicate why we expect the different methods to yield substantially different results, a brief discussion of the concept of valuation that they use may be helpful.

Economic "value" is customarily equated with "price" for making resource allocation decisions affecting goods and services marketed in a competitive economy. But, because recreational use is not marketed, in the usual sense, we lack prices for such uses of many public wild lands. It should be noted that it is a common practice to use non-market-price values attributed to benefits of flood control, industrial and municipal water, and navigation, as well as recreation in analyses of water development projects. To aid decisionmakers, therefore, economists have developed the above methods to simulate how a market might operate to arrive at price as an indicator of value. Simulation of a market has the advantage that the difficulties of attempting to actually market recreation can be circumvented and the price a market would indicate can be estimated.

Although the three methods have this estimate as a common objective, they all define the relevant

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price or value differently, and (2) they utilize quite different methods of measuring it. Two methods, the monopoly revenue and visitor survey techniques, approach the problem by estimating the level of attendance that would result at the area at each of several progressively higher admission charges. Each admission price, multiplied by its corresponding estimated attendance figure, yields the total revenue theoretically obtainable at that admission price. From a list of total revenues, the highest is chosen to represent the "market value" of recreation produced by the area. The admission price at which revenues are maximized is assumed to measure the "market value" per visitor-day. Of course, many visitors would not come at this price; we expect, therefore, that the attendance figure corresponding to the "optimum" price would be lower than the present level.

The third method (consumer's surplus) defines the relevant value differently. It assumes that each visitor places an intrinsic, unique, and somehow measurable value on his recreational experience. It attempts to measure this value from an analysis of the expenditure patterns of visitors from varying distances. Once measured, the "surplus" of value a visitor receives from his trip is easily measured as the difference between the intrinsic value of the visit to him and its cost. The summation of these differences, over all visitors, yields the total value obtained by recreationists. This value estimate corresponds, of course, to total present attendance at the area and not to a portion of it as do the previous two.

We expect then, if all three methods actually approximate a market price, that the values per visitor-day of recreation they yield should be nearly the same, even though the methodology they use is quite different. However, as described above, the values per visitor-day they provide apply to quite dissimilar numbers of recreationists. Because the consumer's surplus technique derives value per visitor-day and applies it to the total number of visitors, we expect its total value estimate to be proportionately larger than the monopoly revenue and visitor survey estimates based on some fraction of visitor use.

The Study Area

The three methods were compared by interviewing recreationists along a 7-mile portion of the scenic canyon of the Cache la Poudre River in northern Colorado. The area is within the Roosevelt National Forest, about 50 miles from Fort Collins. It consists of a glaciated valley with a broad flat floor at 7,600 feet elevation, and steep side walls which rise to over 10,000 feet. The river is considered one of the best trout streams in Colorado. Its scenic quality was recognized when it received "preliminary consideration" (along with 66 other rivers in the U. S.) by the Wild Rivers Study Team for possible inclusion in the Wild Rivers Bill which would have preserved the river in its free-flowing state.

Presently, recreationists camp, picnic, and fish at many developed and undeveloped sites along this section of the river. All sites are easily accessible from paved Colorado Route 14. The Forest Service has developed facilities at the Home Moraine interpretive display and the 15-unit Sleeping Elephant Campground.

Methods

Necessary data were gathered from on-site personal interviews with a 20-percent sample of recreationists during the summer of 1966. Place of origin and round-trip expenditures of visitors were obtained to permit valuation with the "consumer's surplus" and "monopoly revenue" methods. The third, and more direct, "visitor survey" method of valuation relied upon visitors' responses to a question, "How much more than your present costs of use would you willingly pay to use this area?"

Briefly, the consumer's surplus and monopoly revenue methods proceed in the following way. Questionnaire answers were arranged according to the zone of origin of visitors. The eight zones were roughly concentric around the study site. For each zone, average cost per visitor-day[2] at the site was determined. The rate of use (visitor-days use per 100,000 population) was estimated from the population of the zone. The questionnaire data are summarized in table 1.

The visitor survey method derives the relationship between costs and use-rates more directly. The relationship is based on responses to the "willingness-to-pay" question. To minimize the obvious possibility of bias in the answers visitors gave for a question of this type, they were asked,

[2] One visitor-day is defined here as 12 visitor-hours spent at the study area.

Table 1.--Average total cost and use-rates of visitors by zone of origin

Zone	Round-trip distance	Visitor-days use		Cost per visitor-day[2]
		Per season[1]	Per 100,000 population per season	
	Miles	Number		
1	0- 100	2,511	4,577.3	$4.37
2	101- 200	1,576	2,179.5	4.13
3	201- 300	5,451	521.0	4.14
4	301- 400	334	151.0	7.37
5	401- 600	42	11.9	5.58
6	601-1,200	1,088	16.1	6.15
7	1,201-1,800	715	1.9	7.09
8	over 1,800	190	.1	10.83
Total or mean[3]		11,907		4.86

[1]Total visitor-hours per season divided by 12 (the number of visitor-hours per visitor-day).
[2]Travel plus on-site expenditures, as obtained from visitors' statements.
[3]Weighted for number of visitor-days and length of stay.

through a "bidding game" question, for the additional dollar cost they would incur rather than forego the visit.[3] As a matter of interest and for comparative purposes, they were similarly asked the additional round-trip travel time they would be willing to incur:

	Willingness to--	
Zone	Pay	Travel
	(Dollars)	(Hours)
1	1.16	1.12
2	.87	.81
3	.91	.66
4	.95	.84
5	.34	.16
6	.53	.49
7	.78	.55
8	.94	.94
Mean[4]	0.90	0.76

[3]*While being an obviously difficult question and one for which accuracy of answers may be suspect, this approach has been used in attempting to define demand for recreation. For example, see: Jack L. Knetsch and Robert K. Davis. Comparisons of methods for recreation evaluation. Water Research, ed. by A. V. Kneese and S. C. Smith. 526 p. Baltimore: The Johns Hopkins Press. 1965.*
[4]*Weighted for number of visitor-days and length of stay.*

Results

The value of the area's recreation benefits in 1966 was estimated by the three methods discussed above. Depending upon which method of valuation policymakers designate as appropriate, recreation benefits for the 7-mile portion of the Cache la Poudre River in Colorado were worth approximately either $4,000 or $13,000 in 1966. The estimates are presented in table 2, together with capitalized values of future benefit streams at two different interest rates. The capitalized value figures explicitly assume constant future benefits at the 1966 level.

"Visitor-days use" and "total 1966 value" figures differ significantly between (1) the consumer's surplus estimate, and (2) the monopoly revenue and visitor survey estimates, because they define the relevant use level differently, as discussed previously. Of interest is the similarity of all figures for the monopoly revenue and visitor survey methods, and the near coincidence of all three "value per visitor-day" figures. The agreement between the monopoly revenue and visitor survey estimates of "an optimal price" lends a measure of confidence to their ability to estimate the value they aim at. All three "value per visitor-day" figures are clustered near $1, increasing our confidence in their ability to give consistent estimates of the value of a day's use of the area to visitors.

Table 2.--1966 benefits and capitalized value of recreation at the
study site by three economic methods

Method	Value per visitor-day	Estimated visitor-days use	Total 1966 value	Capitalized value at 3 percent	Capitalized value at 8 percent
Consumer's surplus	$1.07	11,907	$12,740	$424,700	$159,200
Monopoly revenue	.93	4,321	4,020	134,000	50,200
Visitor survey	1.11	4,803	5,330	177,700	66,600

Discussion

Estimates of value in the form of an imputed price of benefits of wild land recreation can be developed by economists and are much easier to obtain compared to actually establishing a market for recreational use and observing visitor's responses to different prices for visitation. These estimates may be useful in making decisions about resource allocation. The comparison of methods presented in this study should aid in the selection of an appropriate technique in other valuation problems. Perhaps the most interesting aspect of this comparison is the clustering of the value-per-visitor-day figures near $1. But it is obvious that estimates of total value yielded by different methods are not close together. Less obvious, but more important from an economical point of view, and the reason for much of the differences, is that the methods do not attempt to measure exactly the same thing. As discussed above, a fundamental difference between the methods is the number of visitors their value estimate is applied to. All attempt to estimate the value of a day's recreation; for the consumer's surplus method, this value is multiplied by total present use to obtain the total value of benefits; for the visitor survey and monopoly revenue methods, this value is multiplied only by that portion of present use that could be expected to willingly pay this amount for use of the area in the form of an entrance fee. It is common for development agencies to use the former (total use) approach even though it is obvious that this is not consistent with the usual concept of the price-quantity relationship determined in a market.

Finally, two notes of caution must be mentioned in connection with the use of such value estimates. First, many other valuation studies have incorporated bias from several sources (some of considerable magnitude) into the value estimates. Some, but not all, of the bias factors can be and were corrected for in this study. While this considerably improves them, none of the methods precisely measures the figure it seeks. When they are used, the presence of uncontrolled biasing factors should be recognized.

Secondly (and more important), even if the simulation processes of the methods were unbiased, the sought-out value figures are not "market prices" in the usual sense. They represent a measure of value to visitors, but were not arrived at through the interplay of the usual "supply and demand" forces of an actual market. Therefore, to compare such values directly with market values (or any other kind) would be misleading.[5]

For the various reasons discussed above, it can be concluded that some skepticism may be called for when judging estimates of recreation value put forward in plans for recreation development. The need for a uniform policy determination of the appropriate use level to use in benefit calculations is obvious. However, until benefits of other resource uses are determined by methods comparable to the consumer's surplus technique, values more closely approximating a market price are provided by the visitor survey and monopoly revenue approaches, of which the monopoly revenue technique is most free of uncontrolled sources of bias.

[5]For more detailed discussion, see: Wendell Beardsley. Bias and noncomparability in recreation evaluation models. Accepted for publication (early 1971) in Land Economics.